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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2018/2019

PPS0034 – INTRODUCTION TO PROBABILITY AND STATISTICS
(Foundation in Business)

28 MAY 2019
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 4 pages with **FOUR** questions.

2. Attempt **ALL** four questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the answer booklet provided. All necessary workings **MUST** be shown.

4. **Formulae** are provided at the back of the question paper.

5. **Statistical table** is provided.

QUESTION 1

a. Given below is a discrete probability function for the number of books sold at a bookshop last year.

x	5	6	7	8	9	10
$P(X=x)$	0.1	0.2	c	0.3	0.1	0.05

   i.   Find the value of c. (3 marks)

   ii.   Calculate the cumulative probability function, $F(X)$. (2 marks)

   iii. What is the probability that X is an odd number? (2 marks)

   iv. Find the mean and variance of X. (Give your answer in 4 decimal places) (6 marks)

b. Consider the probability density function for a continuous random variable Y,

$$f(y) = \begin{cases} k(5+3y) & ; \quad 3 < y \le 5 \\ 0 & ; \quad \text{otherwise} \end{cases}$$

   i.   Show that $k = \dfrac{1}{34}$. (4 marks)

   ii.   Determine the mean and standard deviation of Y. (8 marks)

(Total = 25 marks)

QUESTION 2

a. Sixty three percent of the residents of Taman Megah are opposed to the implementation of plan A. In a random sample of 18 residents, what is the probability that

   i.   the number opposed to the implementation is at least five? (2 marks)

   ii.   the number opposed to the implementation is between ten and sixteen, inclusive? (3 marks)

   iii. exactly 12 agreed with the implementation of plan A? (3 marks)

b. The number of customers that arrive at a food court center is modeled as a Poisson distribution. Assume that on the average there are 10 customers arrived per hour.

   i.   What is the probability that there are 7 or more customers arrived in half an hour? (3 marks)

   ii.   What is the probability that there are less than 15 customers arrived in 90 minutes? (3 marks)

Continued...

c. The amount of time taken (in minutes) by a worker to commute daily from his house to the factory where he works is normally distributed with a mean of 45 minutes and a standard deviation of 12 minutes.

    i. If the afternoon session starts at 11.00 a.m and the worker leaves his house at 10.00 a.m., what is the probability that he will be late to the work? (3 marks)

    ii. What is the probability that he will take at most 38 minutes to reach the factory? (4 marks)

    iii. What is the probability that he will take between 35 to 40 minutes to reach the factory? (4 marks)

(Total = 25 marks)

QUESTION 3

a. Data below give the probability distribution of weights (to the nearest kg) of all eight students in a class.

40	52	59	78	85	52	78	52

    i. List all possible samples of 7 students that can be selected from this class. Then, calculate the mean and the sampling error of each sample.
(11 marks)

    ii. Construct the sampling distribution of the mean weight of all possible samples of 7 students that can be selected from this class. (5 marks)

b. The price of all used cars in Ayer Keroh has a mean of RM 43000 and a standard deviation of RM4500. A random sample of 50 used cars is selected.

    i. What is the mean, and the standard deviation of the mean price of a random sample of 50 used cars selected? (3 marks)

    ii. Find the probability that the mean price is between RM 42100 and RM43650.
(4 marks)

    iii. Find the probability that the mean price is less than RM43800. (2 marks)

(Total = 25 marks)

Continued...

QUESTION 4

a.   A company produces marbles with mean diameters of 1.5 cm. Marbles with diameters that are too short or too long will be rejected. To avoid producing too many rejects, the marbles produced by the machine are sampled from time to time and tested as a check to determine whether the machine is still operating properly. Suppose 50 marbles have been sampled gives a sample mean of 1.52 cm and a sample standard deviation of 0.06 cm. At 1% level of significance, test whether the mean diameter of the marbles produced by the company is different from 1.5 cm.   (10 marks)

b.   In an advertisement, a pizza shop claims that its mean delivery time is less than 30 minutes. A random selection of 36 delivery times has a sample mean of 29 minutes and a standard deviation of 3.5 minutes.
     i.   Is there enough evidence to support the claim at $\alpha = 0.01$?   (10 marks)
     ii.   Construct a 98% confidence interval for the mean delivery time for all orders received at the pizza shop.   (5 marks)

                                                                        (Total = 25 marks)

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Formulae:

1.

	Mean	Variance
Discrete Random Variable X	$\mu = E(X)$ $= \sum xP(x)$	$Var(X) = E(X^2) - [E(X)]^2$ **where** $E(X^2) = \sum x^2 P(x)$
Continuous Random Variable X	$\mu = E(X)$ $= \int_{-\infty}^{\infty} xf(x)dx$	$Var(X) = E(X^2) - [E(X)]^2$ **where** $E(X^2) = \int_{-\infty}^{\infty} x^2 f(x)dx$

2.

	Formula	Mean	Standard Deviation
Binomial Probability	$P(x) = \binom{n}{x} p^x q^{n-x}$	$\mu = np$	$\sigma = \sqrt{npq}$
Poisson Probability	$P(x) = \dfrac{e^{-\lambda} \lambda^x}{x!}$	$\mu = \lambda$	$\sigma = \sqrt{\lambda}$

3.   The z value for a value of x: $z = \dfrac{x - \mu}{\sigma}$

4.   The z value for a value of $\bar{x}$: $z = \dfrac{\bar{x} - \mu_{\bar{x}}}{\sigma_{\bar{x}}}$

         where $\mu_{\bar{x}} = \mu$ and $\sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}}$

5.   Sampling error = $\bar{x} - \mu$

         Non-sampling error = incorrect $\bar{x}$ − correct $\bar{x}$

6.   Point estimate of $\mu = \bar{x}$

         Margin of error = $\pm 1.96 \sigma_{\bar{x}} = \pm 1.96 \dfrac{\sigma}{\sqrt{n}}$ or $= \pm 1.96 s_{\bar{x}} = \pm 1.96 \dfrac{s}{\sqrt{n}}$

7.   The $(1 - \alpha)100\%$ confidence interval for μ is

         $\bar{x} \pm z\sigma_{\bar{x}}$ if σ is known

         $\bar{x} \pm zs_{\bar{x}}$ if σ is not known

         where $\sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}}$ & $s_{\bar{x}} = \dfrac{s}{\sqrt{n}}$